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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
JEAN-PAUL DEBALME, ET AL.	: EXAMINER: JEFF H. AFTERGUT
SERIAL NO: 08/913,518	:
FILED: APRIL 6, 2004	: GROUP ART UNIT: 1733
FOR: PROCESS AND DEVICE FOR THE MANUFACTURE OF A COMPOSITE MATERIAL	:

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

The present Appeal Brief is submitted in response to the Final Rejection of October 7, 2004.

REAL PARTY IN INTEREST

The real party in interest in the present appeal is SAINT GOBAIN VETROTEX FRANCE S.A. having place of business at 130 avenue des Follaz, Chambery, 73000, France.

RELATED APPEALS AND INTERFERENCES

Appellant, appellant's legal representatives, and assignee are not aware of any other appeals, interferences, or judicial proceedings that will directly effect or be directly affected by or have a bearing on the board's decision in the pending appeal.

STATUS OF CLAIMS

Claims 1 and 5-17 are pending in this application and are being appealed.

STATEMENT OF AMENDMENTS

An Amendment under 37 C.F.R. §1.116 was filed on January 6, 2005 in response to the Final rejection of October 7, 2004. In reply, an Advisory Action was mailed on January 18, 2005, indicating that Appellant's reply of January 6, 2005 would be entered for purposes of Appeal.

SUMMARY OF CLAIMED SUBJECT MATTER

Briefly recapitulating, Appellant's invention, as recited in independent Claim 1, and as shown in a non-limiting illustration of the instant invention in Figure 1, relates to a process for continuously manufacturing a rigid void-free composite product, including the following steps: (A) preparing intimately blended commingled threads 11 containing glass filaments

and filaments of thermoplastic organic material;[1] (B) providing a strip of fabric 23[2] made from the intimately blended commingled threads 11[3] and a plurality of continuous threads including at least 80% by weight of the intimately blended commingled threads 11;[4] (C) continuously depositing onto a moving conveyor 19 two layers,[5] one of the two layers includes the plurality of continuous threads in a form of continuous threads continuously deposited in a direction of movement of the moving conveyor 19,[6] wherein the continuous threads are continuously deposited in a form of superposed loops and further the continuous threads are continuously deposited in a form of chopped threads 18,[7] while the other one of the two layers includes the strip of fabric; (D) continuously transferring the two layers combined through a plurality of zones where the two layers are heated and cooled,[8] while being sufficiently compressed to form a continuous rigid void-free composite material capable of being molded; and (E) cutting up[9] the rigid void-free continuous composite material into a plurality of sheets[10] and winding the continuous rigid void-free composite material onto a rotating drum, wherein the glass filaments deposited in the claimed process in total include more than 40% by weight[11] of the glass filaments and the filaments of thermoplastic organic material deposited in the claimed process. The claimed process thus leads to improved rigid and void-free composite products.[12]

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[1] See Appellant's Specification from page 8, line 34 to page 9, line 3 and in corresponding Figure 1 (numerals 10, 11).
[2] See Appellant's Specification at page 9, lines 15-17 and in corresponding Figure 1 (numeral 23).
[3] See Appellant's Specification from page 8, line 34 to page 9, line 3 and in corresponding Figure 1 (numeral 11).
[4] See Appellant's Specification at page 9, lines 35-36 and in corresponding Figure 1 (numeral 23).
[5] See Appellant's Specification at page 8, lines 35-38 and in corresponding Figure 1 (numerals 23 and 28).
[6] See Appellant's Specification at page 9, lines 8-15 and in corresponding Figure 1 (numeral 19).
[7] See Appellant's Specification at page 9, lines 8-10.
[8] See Appellant's Specification at page 10, lines 12-21 and in corresponding Figure 1 (numerals 31-39).
[9] See Appellant's Specification at page 10, lines 22-24.
[10] See Appellant's Specification at page 10, lines 22-24 and in corresponding Figure 1 (numeral 40).
[11] See Appellant's original Claim 1.
[12] See Appellant's Specification at page 1, lines 4-8.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal and outstanding in the present Application are as follows: (1) The rejection of Claims 1 and 5-14 as being obvious under 35 U.S.C. § 103(a) over O'Connor (U.S. Patent No. 4,800,113) in view of Kent (European Patent No. EP 630,735A2) or Nemoto et al. (Japanese Patent No. JP 04-201412A, herein referred as "Nemoto") further taken with either one of Schermutzki (U.S. Patent No. 4,743,187) or Baumann (UK patent No. UK 2,040,801A) and optionally further taken with Francis, Jr. (U.S. Patent No. 2,543,101, herein referred as "Francis"); and (2) the rejection of Claims 15-17 as being obvious under 35 U.S.C. § 103(a) over O'Connor, Kent, Nemoto, Schermutzki, Baumann and Francis as set forth above, further taken with Dittmar et al. (Canadian Patent 2,010,285, herein referred as "Dittmar") and the admitted Prior Art.

ARGUMENTS

The rejection of Claims 1 and 5-14

Appellant respectfully requests that the Board reverses the rejection of Claims 1, 5-14 because the applied references O'Connor, Kent, Nemoto, Schermutzki, Baumann and Francis, taken individually or in combination, do not teach or suggest all the features of Appellant's independent Claim 1. O'Connor discloses a process for preparing fiber reinforced thermoplastic articles wherein thermoplastic fibers and reinforcement fibers can be intermingled to produce a composite yarn, which is used to weave a fabric. O'Connor, however, fails to teach or suggest Appellant's claimed ***continuously depositing of two layers onto a moving conveyor***, one layer ***including the plurality of continuous threads***, the other one ***including the strip of fabric***. In particular, O'Connor not only fails to teach or suggest the claimed two layers deposited continuously onto a moving conveyor, but also fails to teach or suggest that one layer includes the plurality of continuous threads, the other layer includes

the strip of fabric. The final Office Action of October 7, 2005 acknowledges that O'Connor fails to teach the claimed manner in which the layers are disposed upon a conveyor.[13]

The final Office Action of October 7, 2005 asserts that one of ordinary skill in the art would have been motivated to practice the invention of O'Connor in a continuous manner. Appellant respectfully disagrees. O'Connor teaches that the fabric prepared from hybrid yarns is laminated by placing 2 to 10 plies of fabric, cut to a size of about 9" to 10" in a metal mold cavity[14] and further teaches that before melting a hybrid yarn can be prepared, it is woven into a fabric or chopped and layed up as a batt of non-woven fibers.[15] Cutting hybrid yarns to a size of about 9" to 10" or chopping and laying up a hybrid yarn as a batt ***is not*** depositing ***two layers continuously onto a moving conveyor***, one layer ***including the plurality of continuous threads***, the other one ***including the strip of fabric***, as claimed by Appellant. Providing two layers continuously onto a moving conveyor, one layer including the plurality of continuous threads, the other one including the strip of fabric, requires an apparatus configured to feed such layers into a manufacturing apparatus. Such a feeding apparatus would be substantially different from the hot-press apparatus disclosed by O'Connor. Therefore, to achieve continuous process for preparing fiber reinforced thermoplastics as disclosed by Appellant, the process and the apparatus of O'Connor must be substantially modified. Such a modification for continuous composite product manufacturing would additionally require a higher degree of automatisation of the process. Appellant therefore traverses that it would have been obvious to modify the O'Connor patent to practice the invention in a continuous matter.

The final Office Action dated October 7, 2004 states that "one of ordinary skill in the art would have been motivated to practice the invention in a continuous manner to

[13] See the final Office Action dated October 7, 2005 at page 4, lines 17-21.
[14] See O'Connor at page 5, lines 11-16.
[15] See O'Connor at page 1, lines 50-57.

continuously produce the composite material wherein the application of heat and cooling under pressure would have been understood to have taken place as a continuous operation."[16] There is no support for such an assertion. Where do the applied references suggest that one of ordinary skill in the art would have been motivated to practice the O'Connor process in a continuous manner? While the required evidence of motivation to combine need not come from the applied references themselves, the evidence must come from ***somewhere*** within the record.[17] In this case, the record fails to support the proposed modification of the O'Connor system.

Further, the final Office Action dated October 7, 2004 states that "In fact, one skilled in the art would have expected to operation [sic] to have been tested in a batch operation initially and that the use of a continuous operation in O'Connor would have been understood to have been useful where on [sic] skilled in the art at the time the invention was made desired to continuously manufacture the composite material."[18] What is the support of such an assertion? Where do the applied references teach this "fact?" The fact that O'Connor is silent regarding a continuous process does not render obvious operating the O'Connor process in a continuous matter.

The other references Kent, Nemoto, Schermutzki and Baumann, individually or in combination with O'Connor, do not teach or suggest the features of Appellant's Claim 1. In particular the references fail to teach or suggest manufacturing a rigid void-free composite product ***by continuously depositing onto a moving conveyor two layers***, one of two layers

[16] See the final Office Action dated October 7, 2004 from page 4, line 21 to page 5, line 3.
[17] In re Lee, 277 F.3d 1338, 1343-4, 61 USPQ2d 1430 (Fed. Cir. 2002) ("The factual inquiry whether to combine references ... must be based on objective evidence of record. ... [The] factual question of motivation ... cannot be resolved on subjective belief and unknown authority. ... Thus, the Board must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency's conclusion").
[18] See the final Office Action dated October 7, 2004 at page 5, lines 5-9.

including the plurality of continuous threads, the other one of the two layers ***including the strip of fabric*** of Appellant's independent Claim 1.

The Advisory Action of January 18, 2005 points to Schermutzi and Baumann as suggesting a continuous manufacture of composite articles. However, Schermutzi's apparatus for producing reinforced plastic laminates heats ***a resin in a powder form*** so that it adheres as a layer to the belt and can consecutively be conveyed into the compression zone.[19] Further, Schermutzki teaches that ***glass fiber mats*** 4' and 4a' pass through heated rolls 16, 17 and through pressure rolls 18, 19. The glass fiber mats are previously coated with resin powder.[20] The Baumann reference also does not teach or suggest the features of Appellant's Claims 1. Baumann's method of preparing a fiber glass reinforced resin sheet feeds one or more ***fiber glass mats*** 102, 103 to a heating zone.[21] Baumann further explains that ***fiber glass mats*** and ***resin mats*** are fed between two laminating belts 3 and 4.[22] Accordingly, Schermutzki and Baumann together with O'Connor do not teach or suggest the manufacturing a rigid void-free composite product ***by continuously depositing onto a moving conveyor two layers***, one of two layers ***including the plurality of continuous threads***, the other one of the two layers ***including the strip of fabric***, as claimed by Appellant.

Further, Schermutzki and Baumann disclose methods that are substantially different from the process of O'Connor. Schermutzki's apparatus heats a glass fiber mat covered with resin in a powder form to make glass-mat reinforced thermoplastics.[23] Baumann's method uses a double belt laminating machine to produce a continuous sheet which is composed of a

[19] See Schermutzki in the Abstract.
[20] See Schmerutzki at column 6, lines 11-21 and in Figure 5.
[21] See Baumann in the Abstract.
[22] See Baumann at page 2, lines 85-94 and Figure 2.
[23] See Schermutzki at column 1, lines 48-59.

resin and a fiber glass mat.[24] It is unclear how the continuous processes disclosed by Schermutzki and Baumann using a double-belt press can be integrated into O'Connor's static hot press for pressing plies of fabric during 15 minutes. Such an combination would require a complete reconstruction of O'Connor's method and further would change the basic principle of operation of O'Connor's method. A person skilled in the art would not be motivated to make such a change.

Furthermore, Appellant respectfully traverses the obviousness rejection based on the combination of the O'Connor, Kent, Nemoto, Schermutzki, Baumann and Francis patents because there is insufficient evidence for a motivation to combine Francis' method of making felt-like fibrous bats with O'Connor's process for preparing fiber reinforced thermoplastics.

O'Connor prepares fiber-reinforced thermoplastic articles by subjecting the composite fabric to elevated temperature (300°C) and pressure (200psi) in order to allow the escape of air entrapped in the composite fabric or composite. O'Connor, however, does not suggest that melting the thermoplastic material under pressure for intimate contact between the molten thermoplastic material and the fiber reinforcement material would work with a method of making felt like fibrous bats. Francis does not state that the fibers in the bat or web being bonded together due to activation of the potentially adhesive fibers need a "melted thermoplastic material to come into intimate contact with the reinforcement fibers."[25]

In addition, Francis is not concerned by the producing of a fiber-reinforced thermoplastic article. Instead, Francis is concerned with providing felt-like fibrous bats[26] and that a composite product is formed from at least felt like bat or web, so as to leave at least one exposed surface exhibiting felt-like characteristics.[27] Francis states that its structure already achieves the goal of providing felt-like products which combine in a single structure the

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[24] See Baumann at page 2, lines 85-89.
[25] See O'Connor at column 4, lines 27-32.
[26] See Francis at column 1, lines 39-43.
[27] See Francis at column 2, lines 15-26.

properties of thickness, low density and high permeability.[28] The Francis system does not suggest that further improvement is desired, nor that another feature should be added to further improve the felt like layer securely and permanently anchored to a textile layer. In particular, the Francis method does not suggest adding a process of melting thermoplastic material to provide an intimate contact of the thermoplastic material with the reinforcement, such as those disclosed in O'Connor.

The O'Connor and Francis patents, therefore, do not provide the motivation to perform the proposed modification of the O'Connor process. An attempt to bring in the isolated teaching of Francis' method of making a felt-like fibrous bat by anchoring a felt-like layer to a textile layer into the O'Connor process amounts to improperly picking and choosing features from different references without regard to the teachings of the references as a whole.[29]

Accordingly, Appellant respectfully requests that the Board reverses the rejection of Claims 1, 5-14 based on these references.

The rejection of Claims 15-17

The final Office Action rejects dependent Claims 15-17 under 35 U.S.C. § 103(a) as being obvious over O'Connor, Kent, Nemoto, Schermutzki, Baumann and Francis and further in view of Dittmar and the admitted prior art. Appellant respectfully requests that the Board reverse the rejection of Claims 15-17 at least for the reasons stated above regarding independent Claim 1 and further because the combination of O'Connor, Kent, Nemoto, Schermutzki, Baumann, Francis and Dittmar is improper.

[28] See Francis at column 1, lines 1-7.
[29] See In re Ehrreich 590 F2d 902, 200 USPQ 504 (CCPA, 1979) (stating that patentability must be addressed "in terms of what would have been obvious to one of ordinary skill in the art at the time the invention was made in view of the sum of all the relevant teachings in the art, not in view of first one and then another of the isolated teachings in the art," and that one "must consider the entirety of the disclosure made by the references, and avoid combining them indiscriminately.")

The final Office Action relies on Dittmar "[t]o further exemplify that one skilled in the art ... would have incorporated a double band press in the operation."[30] However, the modification of the already modified O'Connor process by further incorporating Dittmar's double conveyor arrangement would require a substantial reconstruction or redesign of the elements of O'Connor, and would change the basic principle of operation of the O'Connor. Specifically, such modification or reconstruction would require that O'Connor's hot press for laminated piles of fabric sheets during 15 minutes[31] would be able to process Dittmar's parallel fiber bundles prepared for a double conveyor.[32] Accordingly, although both methods are concerned in producing fiber composite material, the methods are fundamentally different from each other and cannot be combined without substantial reconstruction and redesign of the described method.[33] A person of ordinary skill in the art would not have been motivated to make such a modification.

In addition, the final Office Action dated October 7, 2004 admits that "***there is still no evidence*** that one would have provided a roller pair and the entrance to the double band press which wee [sic] heated and a roller pair at the exit to the double band press which were cooled."[34] The final Office Action then turns to what it calls the "admitted prior art" and refers to a passage from Appellant's Specification at page 10. First, Appellant points out that this passage ***is not*** admitted prior art. What is "known" is not necessary prior art. This passage does not use the term "prior art." Second, the final Office Action admits that, even assuming this teaching from Appellant's Specification as prior art, "***it just is not clear*** whether one skilled in the art at the time the invention was made would have known to utilize

[30] See the final Office Action dated October 7, 2004 at page 2, lines 17-19.
[31] See O'Connor at column 5, lines 11-19.
[32] See Dittmar at page 4, lines 6-17.
[33]See MPEP 2143.01 stating that the "fact that references can be combined or modified is not sufficient to establish *prima facie* obviousness"; see also same section stating "[a]lthough a prior art device 'may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so,'" (citation omitted).
[34] See the final Office Action dated October 7, 2004 at page 3, lines 6-9 (emphasis added).

the same to consolidate a composite material which was formed from thermoplastic fibers and reinforcing fibers."[35] The fact that such feature "would have been ***within the skill level*** of the ordinary artisan"[36] is insufficient to establish a case of obviousness. Appellant therefore requests the Board to reverse the final rejection of Claims 15-17.

In view of these foregoing comments, each of the pending Claims 1 and 5-17 clearly distinguish over the applied art, and thus the outstanding rejections of Claims 1 and 5-17 must be REVERSED.

Respectfully submitted,

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[35] See the final Office Action dated October 7, 2004 from page 7, line 20 to page 8, line 1 (emphasis added).
[36] See the final Office Action dated October 7, 2004 at page 8, line 5 (emphasis added).

CLAIMS APPENDIX

Claim 1: A process for continuously manufacturing a rigid void-free composite product, comprising the steps of:

preparing intimately blended commingled threads containing glass filaments and filaments of thermoplastic organic material;

providing a strip of fabric made from the intimately blended commingled threads and a plurality of continuous threads including at least 80% by weight of the intimately blended commingled threads;

continuously depositing onto a moving conveyor two layers, one of the two layers including said plurality of continuous threads in a form of at least one of continuous threads continuously deposited in a direction of movement of said moving conveyor, continuous threads continuously deposited in a form of superposed loops and continuous threads continuously deposited in a form of chopped threads, and the other one of the two layers including said strip of fabric;

continuously transferring said two layers combined through a plurality of zones where said two layers are heated and cooled, while being sufficiently compressed to form a continuous rigid void-free composite material capable of being molded; and

at least one of cutting up said rigid void-free continuous composite material into a plurality of sheets and winding said continuous rigid void-free composite material onto a rotating drum,

wherein said glass filaments deposited in said process in total comprise more than 40% by weight of said glass filaments and said filaments of thermoplastic organic material deposited in said process.

Claims 2-4 (Cancelled)

Claim 5: A process according to Claim 1, wherein said one of the two layers comprises exclusively said chopped threads.

Claim 6: A process according to Claim 1, wherein said other one of the two layers comprises exclusively continuous threads.

Claim 7: A process according to Claim 1, wherein a combination of said two layers thus formed is heated and is compressed on two faces before being cooled and cut up or wound.

Claim 8: A process according to Claim 7, wherein:

said one of the two layers is continuously deposited on said moving conveyor and is formed of said chopped threads;

said other one of the two layers is continuously deposited on said one of the two layers and is formed exclusively by said intimately blended commingled threads;

a third layer of chopped intimately blended commingled threads of glass filaments and filaments of a thermoplastic organic material is continuously deposited onto said other one of the two layers;

a combination of said two layers and said third layer thus formed is continuously transferred into a first zone where said combination is heated and then into a second zone where said combination is sufficiently compressed and heated to become rigid and void-free;

said combination is then continuously transferred into a third zone where said combination is sufficiently compressed and cooled to become rigid and void-free, thereby

forming a continuous rigid void-free composite material capable of being molded; and

said continuous rigid void-free composite material is cut up at an exit of the third zone.

Claim 9: A process according to Claim 7, wherein:

said other one of the two layers is continuously deposited on said moving conveyor and is formed exclusively of said intimately blended commingled threads;

said one of the two layers is continuously deposited on said other one of the two layers and is formed of said chopped threads;

a third layer exclusively formed by intimately blended commingled threads of glass filaments and filaments of a thermoplastic organic material is continuously deposited onto said one of the two layers;

a fourth layer of chopped intimately blended commingled threads of glass filaments and filaments of a thermoplastic organic material is continuously deposited onto said third layer;

a combination of said two layers, said third layer and said fourth layer thus formed is continuously transferred into a first zone where said combination is heated, and then into a second zone where said combination is sufficiently compressed and heated to become rigid and void-free;

said combination is continuously transferred into a third zone where said combination is sufficiently compressed and cooled to become rigid and void-free, thereby forming a continuous rigid void-free composite material capable of being molded; and

the continuous rigid void-free composite material is cut up at an exit of the third zone.

Claim 10: A process according to Claim 7, wherein:

said other one of the two layers is continuously deposited onto said moving conveyor and is formed exclusively by said intimately blended commingled threads;

said one of the two layers is continuously deposited on said other one of the two layers;

a third layer formed exclusively by commingled threads of glass filaments and filaments of a thermoplastic organic material is continuously deposited onto said one of the two layers,

a fourth layer is continuously deposited on said third layer, said fourth layer being formed of commingled threads of glass filaments and filaments of a thermoplastic organic material;

a combination of said two layers, said third layer and said fourth layer thus formed is continuously transferred into a first zone where said combination is heated, and then into a second zone where said combination is sufficiently compressed and heated to become rigid and void-free;

said combination is continuously transferred into a third zone where said combination is sufficiently compressed and cooled to become rigid and void-free, thereby forming a continuous rigid void-free composite material capable of being molded; and

the continuous rigid void-free composite material is cut up at an exit of the third zone.

Claim 11: A process according to Claim 7, wherein the width of said one of the two layers is equal to the width of said other one of the two layers.

Claim 12: A process according to Claim 1, wherein a weight of said glass filaments deposited in total represents at least half of a total weight of the two layers deposited onto the conveyer.

Claim 13: A device for manufacturing a rigid void-free composite product, comprising:

a storage device for a plurality of windings of commingled threads containing glass filaments and filaments of a thermoplastic organic material;

a cutter fed with a plurality of continuous threads extracted from said windings;

at least one device positioned and configured to transfer, store, and distribute said commingled threads chopped by said cutter in a form of a sheet;

at least one barrel supporting at least two rolls of fabric made of said commingled threads;

a conveyor positioned and configured to receive said commingled threads thus chopped and a strip of said fabric;

a preheating oven placed at an end portion of the conveyor;

a twin-belt press including a plurality of heating drums in an upstream portion of said twin-belt press and a plurality of cooled rollers in a downstream portion and a central portion of said twin-belt press, said heating drums being configured to sufficiently heat and compress said commingled threads chopped and said strip of fabric to become rigid and void-free, and said cooled rollers being configured to sufficiently cool and compress said commingled threads chopped and said strip of fabric to become rigid and void-free, thereby forming a rigid void-free composite material capable of being molded; and

an automatic guillotine device positioned and configured to cut the rigid void-free composite product,

wherein said glass filaments deposited in said process in total comprise more than 40% by weight of said glass filaments and said filaments of thermoplastic organic material deposited in said process.

Claim 14: A device for manufacturing a rigid void-free composite product, comprising:

a storage device for a plurality of windings of commingled threads containing glass filaments and filaments of a thermoplastic organic material;

a conveyor positioned and configured to receive the commingled threads deposited in a form of at least one of strips of fabric, continuous threads and chopped threads;

a first barrel disposed upstream of said conveyor and supporting at least two rolls of fabric made of said commingled threads;

at least one distribution device configured to distribute said commingled threads in a form of continuous threads, said at least one distribution device being disposed above said conveyor;

a second barrel disposed downstream of said conveyor and supporting at least two rolls of fabric made of said commingled threads;

at least one of a second distribution device configured to distribute said continuous thread and a cutter followed by a third distribution device configured to distribute said continuous threads chopped by said cutter;

a preheating oven placed at an end portion of the conveyor;

a twin-belt press including a plurality of heating drums in an upstream portion of said twin-belt press and a plurality of cooled rolls in a downstream portion and a central portion of said twin-belt press, said heating drums being configured to sufficiently heat and compress said commingled threads deposited onto said conveyor to become rigid and void-free, and

said cooled rollers being configured to sufficiently cool and compress said commingled threads deposited onto said conveyor to become rigid and void-free, thereby forming a rigid void-free composite material capable of being molded; and

an automatic guillotine device positioned and configured to cut the rigid void-free composite product,

wherein said glass filaments deposited in said process in total comprise more than 40% by weight of said glass filaments and said filaments of thermoplastic organic material deposited in said process.

Claim 15: A process for continuously manufacturing a rigid void-free composite product according to Claim 1, wherein the step of continuously transferring said two layers combined through said plurality of zones comprises the steps of passing said two layers through a:

first heating process configured to heat the two layers with two adjacent rolls, which heat and drive the two layers between two belts,

second heating process configured to heat and press the two layers between said two belts,

first cooling process configured to cool and press the two layers between said two belts, and

second cooling process configured to cool the two layers with additional two adjacent rolls, said additional rolls cool and drive the two layers between two belts.

Claim 16: A device for manufacturing a rigid void-free composite product according to Claim 13, further comprising:

a pair of adjacent heating rollers configured to preheat the commingled threads after the preheating oven;

a pair of adjacent cooling rollers configured to cool the composite material after the twin-belt press; and

wherein a pair of conveyor belts drive the commingled threads therebetween and the conveyor belts are also driven around said adjacent heating rollers, said twin-belt press and said adjacent cooling rollers.

Claim 17: A device for manufacturing a rigid void-free composite product according to Claim 14, further comprising:

a pair of adjacent heating rollers configured to preheat the commingled threads after the preheating oven;

a pair of adjacent cooling rollers configured to cool the composite material after the twin-belt press; and

wherein a pair of conveyor belts drive the commingled threads therebetween and the conveyor belts are also driven around said adjacent heating rollers, said twin-belt press and said adjacent cooling rollers.

EVIDENCE APPENDIX

NONE

RELATED PROCEEDINGS APPENDIX

NONE